

Claims:

1. A curing station for polymerizing contact lenses, comprising:

5 a floor for supporting a plurality of carriers holding polymerizable contact lenses;

a light source for directing light to the lenses to cure said lenses; and

a plurality of article handling devices supported beneath the floor for engaging the lens
10 carriers and moving the lens carriers around the floor.

2. A curing station according to Claim 1, wherein:

each of the devices has a retracted position and an extended position;

15 in the retracted position, the device is entirely below the floor to facilitate moving the
device beneath the floor; and

in the extended position, the device extends above the floor to engage the lens carriers
20 and to move the lens carriers across the floor.

3. A curing station according to Claim 2, wherein:

the floor forms a plurality of openings; and

25 as the devices change from the retracted positions to the expended positions, the devices
move upward through said openings.

4. A method of moving contact lens carriers around a defined area, comprising:

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positioning a plurality of lens carriers in the area;

supporting a plurality of article handling devices beneath the area, wherein each of said devices has an engaged state, in which the device engages one of the lens carriers, and a
5 disengaged state, in which the device is disengaged from the lens carriers;

maintaining each device completely beneath said area when the device is in the disengaged state to facilitate moving the device;

10 changing each device from the disengaged state to the engaged state to engage the lens carriers; and

using the devices, when the devices are in the engaged states, to move the lens carriers across the area.

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5. A method according to Claim 4, wherein the defined area is on a floor, and the changing step includes the step of extending each device upward, through the floor, as the device changes from the disengaged state to the engaged state.

20 6. A method according to Claim 5, wherein the floor defines a series of openings, and the extending step includes the step of extending each device upward, through one of said openings, as the device changes from the disengaged state to the engaged state.

7. Article handling apparatus for moving contact lens carriers, around a defined area,
25 comprising:

a first set of article handling devices for receiving a multitude of contact lens carriers, for forming a first array of lens carriers in a first section of said area, and for moving said lens carriers through said first section; and

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a second set of article handling devices for receiving contact lens carriers from said first section, for forming a second array of lens carriers in a second section of said area, and for moving the lens carriers of said second array through said second section.

5 8. Apparatus according to Claim 7, wherein the first set of devices includes:

a first assembly for assembling a group of lens carriers in a row in a first position, with neighboring carriers in the row contiguous to each other;

10 a second assembly for moving said row of lens carriers from the first position and into the first section of the area;

a third assembly for moving said row of lens carriers, across the first section and into a final position therein; and

15 a fourth assembly for moving said row of lens carriers from the final position and out the first section.

9. Apparatus according to Claim 8, wherein the first assembly includes:

20 a support member;

an arm mounted on the support member for movement therealong; and

25 means to move the first arm between first and second positions to engage lens carriers and to assemble said group of lens carriers in said row.

10. Apparatus according to Claim 2, wherein the second assembly includes:

30 a support member;

an arm supported by the support member for movement toward and away from the support member; and

- 5 means to move the arm, relative to the support member, to engage said row of lens carriers in the first position and to push said row of lens carriers from the first position and into the first section.

11. Apparatus according to Claim 8, wherein the third assembly includes:

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a support member located below the first section;

an arm subassembly supported by the support member for horizontal and vertical movement; and

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means to move the arm subassembly vertically from a position beneath the first section, to a position extending above the first section, and to move the arm subassembly horizontally to engage said row of lens carriers in the first section and to move the row of lens carriers across the first section and into said final position therein.

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12. Apparatus according to Claim 2, wherein the fourth assembly includes:

means to engage the row of lens carriers in said final position, and to push the lens carriers of said row in a first direction, wherein the lens carriers of said row are located, one carrier at a time, in a discharge position; and

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means to engage each of the lens carriers of said row, one carrier at a time, when the lens carrier is in the discharge position and to move the lens carrier out of the first section.

- 30 13. Apparatus according to Claim 7, wherein the second set of devices includes:

a first assembly for forming a row of lens carriers in a first position in said second section, wherein neighboring carriers in the row are contiguous to each other;

- 5 a second assembly for moving said row of lens carriers through a sequence of positions in the second section and to a final position therein; and

a third assembly for moving said row of lens carriers out of the second area.

- 10 14. Apparatus according to Claim 7, wherein the first assembly includes

means to engage a plurality of lens carriers, one at a time, in a carrier receiving position, and to move the lens carriers in a first direction to form said row of lens carriers.

- 15 15. Apparatus according to Claim 13, wherein the second assembly includes:

support means;

- 20 a pusher subassembly supported by the support means for movement toward and away from the support means; and

- means to move the pusher subassembly to engage a plurality of rows of lens carriers, one row at a time, when each of said rows is in the first position in the second section, and to push the rows across the second section to form said second array of lens carriers in the
25 second section, wherein said second array includes a plurality of rows of lens carriers, with neighboring rows in the second array contiguous to each other.

16. Apparatus according to Claim 15, wherein:

the second array of lens carriers in the second section includes a last row of lens carriers in a last row position; and

- the second assembly includes an engaging subassembly supported for movement toward
5 and away from said last row position, and to engage a row of lens carriers in said last row position and to move said last row of lens carriers away from the second array.

17. Apparatus according to Claim 16, wherein the engaging subassembly includes:

- 10 a series of engagement members supported for horizontal movement beneath the second section and for vertical movement; and

means to move the engagement members vertically from a position beneath the second section, to a position engaging the lens carriers in said last row, and to move the
15 engagement members horizontally to move the lens carriers of said last row away from the array and into said final position.

18. Apparatus according to Claim 13, wherein the third assembly includes:

- 20 a carrier receiver located adjacent the final row position;

a subassembly for engaging the lens carriers in the final row position and moving the lens carriers, one at a time, onto the carrier receiver; and

- 25 means to push the lens carriers off the carrier receiver and out of the second section.

19. Apparatus according to Claim 18, wherein said subassembly includes:

a series of beams; and

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means to move said series of beams across the final row position to engage the lens carriers therein and to push the lens carriers onto the carrier receiver.

20. A contact lens holding station having an adjustable buffer, comprising:

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means defining an area for holding lens carriers;

a first assembly for receiving contact lens carriers and forming the carriers into an array in said area, said array including an adjustable number of rows;

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a second assembly for engaging the lens carriers in any one of a defined group of said rows to pull the carriers in the engaged row away from the array and to move the carriers of the engaged row to a given location; and

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a third assembly for conveying lens carriers from the given location out of the station.

21. A station according to Claim 20, wherein the second assembly includes:

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a plurality of engagement members supported for horizontal movement beneath said array and for vertical movement;

means to move the engagement members vertically from a position beneath said array, to a position engaging the lens carriers in one of said defined group of rows, and to move the engagement members horizontally to move the lens carriers in the engaged row away from the array.

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22. A station according to Claim 20, wherein said array includes a last row having a varying position, and the station further comprises control means holding data identifying the location of said last row.

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23. A station according to Claim 20, wherein the second assembly is adapted to engage the lens carriers in any row of the array.

24. A method for holding contact lens carriers in a station, comprising;

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moving the lens carriers into the station;

forming the lens carriers into an array, said array having an adjustable number of rows;

10 engaging the lens carriers in any one of a defined group of the rows of the array to move the carriers in said one row away from the array; and

moving the carriers of said one row out of the station.

15 25. A method according to Claim 24, wherein the engaging step includes the step of engaging the lens carriers in any one row of the array.

26. A method according to Claim 24, wherein the array includes a last row having a variable position, the method further comprises the step of keeping track of the position

20 of said last row, and wherein the engaging step includes the step of engaging the lens carrier in said last row to move the carriers of the last row away from the array.